

**JSS Academy of Higher Education & Research**

( Deemed to be University )

Re-Accredited "A+" Grade by NAAC

Sri Shivarathreeshwara Nagara Mysuru - 570015, Karnataka

Faculty of Life Sciences

# Syllabus

## M.Sc. NUTRITION & DIETETICS

As per UGC's Learning Outcome Based Curriculum  
Framework (LOCF) under the CBCS pattern  
Implementation Year 2021-22 onwards

# MSc

# Syllabus

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## M.Sc. Nutrition & Dietetics

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## **M.Sc. Nutrition & Dietetics**

### **Programme overview**

Government of India under the National Commission for allied and healthcare professions act, 2021 No. 14 of 2021 28th March 2021, recognized Nutrition Science Professional (Dietician & Nutritionist) as allied healthcare profession. Thus, bringing immense importance to the field of Nutritional sciences. Food is fundamental to human existence and maintenance of health. Understanding the importance of good nutrition in human development, Government of India runs many flagship programs targeting population of various life stages like pregnant women, children, school goers etc e.g., midday meal program, ICDS, Poshan Abiyan, Vitamin A prophylaxis program, national nutritional anaemia control prophylaxis, national goitre control program etc it becomes imperative to study the field of nutritional sciences. In due cognizance JSS Academy of Higher Education & Research, Department of Nutrition & Dietetics offers both undergraduate and post graduate program, namely B.Sc. (Basic/Hons) in Food, Nutrition & Dietetics and Master's in Nutrition & Dietetics.

The programs are aimed at offering quality graduates with necessary skill sets who can be national assets to fulfill the demand for required manpower to run the academia, become policy makers, to run or be part of various nutrition programs, to promote Make in India policy and involve in entrepreneurship activities.

The following are the objectives of the Programme

- The Department of Nutrition & Dietetics strives to provide the highest quality educational experiences to the students by incorporating cutting edge research information with the fundamental knowledge and skills needed by nutrition professionals of the future.
- The curriculum supports attainment of the Academy's Educational Objectives like development of higher cognitive skills and develop focus and depth in one or more disciplines.
- To cultivate the virtues, effective communication, develop leadership skills and to develop a global perspective.
- The nutrition curriculum prepares students to be leaders in the next generation of nutrition scientists, public health, and clinical nutrition practitioners.

Programme outcome:

Upon successful completion of the undergraduate degree (basic/hons) in Food Nutrition & Dietetics, students will be well equipped with necessary skills to serve various hospital dietary services, food and nutraceutical, wellness centers, hold position in various nutrition program run by Government of India or pursue higher studies leading to research in areas pertaining to clinical nutrition, molecular nutrition, community nutrition, sports nutrition etc. Students can also aspire for entrepreneurial ventures through start-ups leading to establishment of their own ventures. The program promotes personal scholarship and academic growth, lifelong learning skills, and mastery of core knowledge in nutrition and life sciences.

**Program Specific Outcomes:**

- By the end of the program the students will be able to develop competencies needed to be acquired by a candidate securing B.Sc., (Basic) or B.Sc., (Hons.) degree in Food Nutrition & Dietetics.
- Utilize knowledge from the physical and biological sciences as a basis for understanding the role of food and nutrients in health and disease processes.
- Students will be able to demonstrate critical thinking skills and analytical abilities to identify and solve problems in the nutritional sciences.
- Students will be able to assess nutritional status of individuals in various life-cycle stages and determine nutrition-related conditions and diseases by applying knowledge of metabolism and nutrient functions, food sources, and physiological systems.
- Students will be able to critique and effectively communicate written and oral nutrition information.
- Integrate and use scientific information, research, and critical thinking into evidence-based dietetics practice
- Students will be able exposed multiethnic environmental dimensions within nutrition and the life sciences.
- Apply basic principles of entrepreneurship to Dietetics practice.

**Eligibility**

Candidates who have passed the 10+2 Examination/ Equivalent Examination with at least 40% marks with science as one of the subjects.

**Weightage for assessments (in percentage)**

Type of Course	Formative Assessment / IA	Summative Assessment
Theory	30%	70%
Practical	30%	70%
Projects	30%	70%

SEMESTER I								
SI NO.	Study Components and Code	Title of the Paper	Hr s./ week	Examination				Total Credit
				Dur. in Hours	CIA	Theory/ Practical Exam	Max. Marks	
1	DSC 01	Fundamentals of Food Science	4	3	30	70	100	4
2	DSC 02	Body Composition & Metabolism	4	3	30	70	100	4
3	DSC 03	Life Cycle Nutrition & Physiology	4	3	30	70	100	4
4	AECC	Nutritional Biochemistry & Biochemical Techniques	2	2	-	50	50	2
5	SEC 01	Research Methodology & Statistics	2	2	-	50	50	2
6	Practical 01	Physiology & Hematology	4	3	15	35	50	2
7	Practical 02	Nutritional Biochemistry	4	3	15	35	50	2
	Total marks and credits						500	20
SEMESTER II								
1	DSC 04	Advance Nutrition	4	3	30	70	100	4
2	DSC 05	Principles of Diet Therapy	4	3	30	70	100	4
3	DSC 06	Medical Nutrition Management	4	3	30	70	100	4
4	DSE 01a (Or) DSE 01b (Or) DSE 01c	01a.Pediatric Nutrition (Or) 01b. Geriatric Nutrition (Or) 01c. Nutraceuticals & Functional foods	4	3	30	70	100	4
5	DSE 02a (Or) DSE 02b (Or) DSE 02c	02a Sports Nutrition (Or) 02b Molecular Nutrition (Or) 02c Research Methods in Clinical Nutrition	4	3	30	70	100	4
6	SEC 02	Personalized Nutrition	2	2	-	50	50	2
7	Practical 03	Diet Therapy	4	3	15	35	50	2
8	Practical 04	Enteral & Parenteral Nutrition	4	3	15	35	50	2
	Total marks and credits						650	26

SEMESTER III								
Sl. NO.	Study Components and Code	Title of the Paper	Hrs./ Week	Examination				Total Credit
				Dur. In Hours	CIA	Theory/ Practical Exam	Max. Marks	
1	DSC 07	Therapeutic Nutrition	4	3	30	70	100	4
2	DSC 08	Community Nutrition	4	3	30	70	100	4
3	DSC 09	Diet in Endocrine disorders	4	3	30	70	100	4
4	DSE 03a (Or) DSE 03b (Or) DSE 03c	03a Nutrition for Hepatic & Renal Disorders (Or) 03b Nutrition in Cancer & inflammation (Or) 03c Nutrition for Gut & Brain Health	4	3	30	70	100	4
5	SEC 03	Maternal & Child Nutrition	2	2	-	50	50	2
6	Practical 05	Clinical Nutrition	4	3	15	35	50	2
7	Practical 06	Hospital Internship & Community Nutrition	4	3	15	35	50	2
		Internship	-	-	-	-	50	2
	Total marks and credits						600	24
SEMESTER IV								
	Dissertation						300	12
Total (Semester I to IV)							2050	82

**Abbreviations:**

DSC – Discipline Specific Core; AECC – Ability Enhancement Compulsory Course.  
DSE – Discipline Specific Elective; SS – Soft Skill; SEC – Skill Enhancement Course  
IDE – Interdisciplinary Elective  
Must be chosen from the other discipline offered elective paper.

\*Students may choose any one elective course among the choice offered, specific to the discipline

\*Project Proposal, Presentations, Teamwork and Professional Ethics, Industrial/Institutional Visits etc.



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## **Semester One**

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SEMESTER ONE

No. of hours/week	Credits
4	4

**DSC –0 I- Fundamentals of Food Science**

**Course Objectives-** The paper deals with

- Classification of food, food groups, nutrients, nutritive value of all food groups.
- The factors effecting the cooking of different food groups
- sensory attributes of the food products their acceptability

**Course Outcomes:** At the end of the semester the student will understand

- The concept of food groups, nutritional composition of food groups
- Factors affecting their cooking quality and acceptability.

Unit	Unit content
UNIT I	<p><b>Classification of food, Cereals, Starch, Flour</b>            Concept of food and classification of food.  <b>Cereals</b> –Rice, Wheat and Millets (Ragi, Maize, Barley &amp; Oats) –structure, composition and nutritive value.  <b>Starch</b> - Chemistry, sources, gelatinization, retrogradation, and factors affecting starch gelatinization.            Flour – Types, properties, rheological properties of dough. Functional properties of flour.  <b>Sugar Cookery</b>- Principles and stages of sugar cookery, preparation of crystalline and non-crystalline candies.  <b>Browning Reaction</b>- Enzymatic and Non – Enzymatic browning.</p>
UNIT II	<p><b>Pulses, Legumes, Fruits, Vegetables</b>  <b>Pulses and legumes</b>- Composition, nutritive value, anti-nutritional factors, physical &amp; chemical properties of proteins, pulse cookery.  <b>Fruits</b>– Composition, nutritive value, structure, Texture, pigments and flavour component, changes during cooking and processing and browning reaction.  <b>Vegetables</b> Composition, nutritive value, structure, Texture, pigments and flavour component, changes during cooking and processing and browning reaction.</p>
UNIT III	<p><b>Meat, Poultry, Marine foods Egg, Milk</b>  <b>Meat</b> - Structure, composition, cuts of meat, post-mortem changes, methods of cooking, tenderness of meat.  <b>Poultry</b> - Composition, market forms, selection factors and methods of cooking.  <b>Marine foods</b>- Types, composition, cooking.  <b>Egg</b> – Structure, composition, coagulation, foam formation and its role in cookery.  <b>Milk</b> – Composition, types, nutritive value, physical and chemical properties, coagulation of milk protein, and preparation of milk-based beverages</p>
UNIT IV	<p><b>Spices, Condiments Nuts and Oil seeds Water and Sensory evaluation of foods</b>  <b>Spices and condiments</b> – Composition, Spice principles, their role in cookery.  <b>Nuts and oil seeds</b> – composition, nutritive value, role of nuts and oil seeds in cookery.  <b>Fats and oils</b> - Physical and chemical properties of fats and oil, role in cooking, rancidity, and prevention.  <b>Water</b>- properties, water as medium of cooking- blanching, boiling, steaming, poaching, simmering, reducing.  <b>Sensory evaluation of foods</b> -a) Sensory characteristics of foods - Appearance, Colour and</p>

### References

1. Potter, N.N. (2007) Food Science, AVI publishing company INC West Port Connecticut.
2. Vickie A. Vaclavik, Elizabeth W. Christian, Essentials of Food Science Springer ,Science & Business Media 2013 –.
3. Sri Lakshmi (1998) Food Science, AVI publishing company, Connecticut.
4. Swaminathan, M. (1998) Food Science and Experimental Foods, BAPCO Bangalore.
5. Marion and Banion (1998) Food Science, Mac Millon Company, London.
6. Jones & Bartlett Learning, 16-Jan-2018 Food Science.
7. Shobha Kumari, Handbook of Food Science and Technology, Oxford Book Company, 2014

## SEMESTER ONE

No. of hours/week	Credits
4	4

### DSC – 02 Body Composition & Metabolism

**Course Objectives:** This paper deals with understanding the metabolism of macronutrients viz, carbohydrates, proteins and lipids. The students are also exposed to concepts affecting the metabolism especially the digestion and utilization of the nutrients. The students are also exposed to recent concepts like fetal origins of diseases.

**Course Outcomes:** At the end of this course the students will have a clear understanding of

- Body composition distribution of fluids, body mass percentage
- the metabolism of the macronutrients
- factors affecting their utilization and digestion.

Unit	Unit content
UNIT I	<b>Introduction of human nutrition</b> - Concept of Food groups, RDA of nutrients, Concept of Bioavailability and Bio accessibility. <b>Body composition</b> - Body Compartments, Water- percentage, distribution fat -mass, percentage, distribution. Muscle mass and lean body mass. <b>Carbohydrate's metabolism</b> — Food Sources, Physiological functions, Digestion and Absorption of dietary carbohydrates, Artificial sweeteners. <b>Metabolism of carbohydrates</b> - Glycolysis, TCA cycle, Pentose Phosphate pathway  <b>Dietary Fibre</b> - Definition, sources, types of fibre, role in digestion, Interaction with other nutrients.
UNIT II	<b>Protein metabolism</b>  <b>Proteins</b> - Food Sources, RDA, Concepts of essential and non-essential amino acid, physiological functions, Digestion and absorption,  Bioavailability of plant and Animal sources, Factors affecting protein bioavailability  Nitrogen balance concept. Methods for evaluating protein quality
UNIT III	<b>Lipid metabolism</b> <b>Fats and lipids</b> - Food Sources, RDA, physiological functions, Digestion and absorption, lipid metabolism in liver, lipotropic factors, deposition of fat in the body, <b>Lipids</b> - Concepts of visible and invisible fats. EFA, SFA, MUFA, PUFA- sources and physiological functions, role of lipoproteins, triglycerides in health and disease.

<b>UNIT IV</b>	<p><b>Current concepts in human nutrition</b></p> <p><b>Nutrigenomics-</b> definition, nutrient gene interaction, nutrigenomics and non-communicable diseases, Impact of nutrigenomics on – nutrition research, nutrition therapy,</p> <p><b>Fetal origins of adult disease-</b>nutritional basis and genetic link, intrauterine nutrition and maternal nutrition, birth weight, Barker's hypothesis.</p>
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## References

1. Modern Nutrition in Health and Disease , Robert J. Cousins PhD (Author), Katherine L. Tucker Ph.D. (Author), Thomas R. Ziegler M.D., 11<sup>th</sup> Edition, 2014.
2. *Understanding Normal and Clinical Nutrition*, Eighth Edition, Sharon Rady Rolfes, Kathryn Pinna, Ellie Whitney. Wadsworth, Cengage Learning 2009.
3. Advanced Nutrition and Human Metabolism, Sareen S. Gropper, Jack L. Smith, James L. Groff, 2009
4. Mahan, L.K., Arlin, M.T., (2012): Krause's Food, Nutrition and Diet Therapy, 13th Ed. W.B. Saunders Company, London.
5. Sri Lakshmi B, Nutrition Science, 5<sup>th</sup> Edition, New age International Publishers. 2018.
6. Nutrigenomics and Nutrigenetics in Functional Foods and Personalized Nutrition Lynnette R. Ferguson, 2013, CRC Press.

## SEMESTER ONE

### DSC-03 Life Cycle Nutrition & Physiology

No. of hours/week	Credits
4	4

#### Course Objectives:

- Learn about human anatomy and physiology, understand the normal body functioning process.
- Learn about the adequate nutritional requirement and dietary principles throughout the human life cycle.

#### Course Outcomes: At the end of the course, students would be able to

- Describe the organization of different organ system, their structure and functions in the human body.
- Exposed to the practical experience in determination of few physiological parameters related to body function.
- Understand the importance of balanced diet and plan adequate nutritional support for different age groups.

Unit	Unit content
UNIT I	<b>Structure and functioning of human physiology</b> <ul style="list-style-type: none"> <li>• <b>Basics of physiology</b> -Structure and functionality of cell. Tissues: types, structure and function. Functions of sensory organs- eye, nose, ear, tongue and skin.</li> <li>• <b>Digestive and respiratory system:</b> Major organs of the digestive system and their function- primary and accessory digestive organs. Physiology of digestion and absorption mechanism; Role of enzymes and hormones in digestion. Respiratory system: Major organs and their functions, physiology of exchange of gases.</li> </ul>
UNIT II	<b>Physiology &amp; functioning of organ systems</b> <p><b>Circulatory system:</b> Functions and components of blood, Functional anatomy of heart.</p> <p><b>Nervous system and Endocrinology:</b> Nervous system - Introduction to nervous system- central and peripheral nervous system, Structure of neuron. Endocrinology - Endocrine glands, hormones and their functions</p> <p><b>Reproductive and Excretory system: Reproductive system-</b> Structure and functions of sex organs, Functions of reproductive hormones, Menstrual cycle.</p> <p><b>Excretory system-</b> Structure and function of kidney and urine formation.</p>
UNIT III	<b>Nutritional requirement during pregnancy &amp; lactation, infancy &amp; childhood</b> <ul style="list-style-type: none"> <li>• <b>Pregnancy &amp; Lactation</b> – Stages of pregnancy, physiological changes, Physiology of lactation &amp; hormonal control, Nutritional requirement during pregnancy &amp; lactation, Importance &amp; Nutritional components of Colostrum, Galactagogues, Types of milk formulae.</li> <li>• <b>Infancy &amp; Childhood-</b> Nutritional requirement during infancy, preschool, school age and adolescence, Factors influencing growth and development, Difference between breast feeding and bottle feeding, Weaning Foods, Packed lunch, Adolescence - physical changes during menarche, hormonal changes.</li> </ul>

	<ul style="list-style-type: none"> <li>Nutritional problems – Pre-school and school children - Eating disorders, Dental caries. Adolescence - IDA, obesity, anorexia nervosa and bulimia nervosa.</li> </ul>
<b>UNIT IV</b>	<p><b>Nutritional requirement in Adults, Elderly</b></p> <ul style="list-style-type: none"> <li><b>Adults (men and women)</b> – Nutritional requirement and dietary recommendation for adults, Nutritional support during pre and post menopause in women.</li> <li><b>Elderly</b> - Physiological changes in ageing, Nutritional problems in elderly and their management. Nutritional needs during – Sensory loss, Oral health and GI functions, Neuromuscular and skeletal functions, Renal and cardiac function, Immuno-competence.</li> </ul>

#### References

1. K Sembulingam Physiology, 2017,
2. Textbook of Physiology, AK Jain, Volume-2, 2017, Avichal Publishing Company.
3. Human physiology by CC Chatterjee, Vol I & II, CBS Publishers & Distributors PVT Ltd.
4. Life Cycle Nutrition – An evidence-based approach, Sari Edelstein, Second Edition.2014.
5. Essentials of Life Cycle Nutrition, Judith Sharlin and Sari Edelstein, 2011, Jones & Barlett Learning.
6. Nutrition A Lifecycle Approach, Ravinder Chadha (Editor), Pulkit Mathur, 2015, Orient Black swan.



## SEMESTER ONE

No. of hours/week	Credits
2	2

### AECC – Nutritional Biochemistry & Biochemical Techniques

**Course Objectives:** the paper deal with

- Detailed cell structure, cell membrane composition with membrane systems and receptors and nucleic acid structure and properties.
- All macronutrients structure with their Physico-chemical properties and functions.
- Enzymes classification with the basics of analytical techniques.
- Practical estimation of proximate composition with the demonstration of the few techniques.

**Course Outcomes:** At the end of the course, students will be able to understand the

- Functionality of cell and its components, interaction of the cell through membrane systems.
- The macronutrient structure and their functional role in the biological system.
- Different enzymes and their physiological role in various chemical reactions.
- The application of biochemical techniques at the laboratory level.

Unit	Unit content
UNIT I	<b>Cell &amp; Nucleic acids</b> <ul style="list-style-type: none"><li>• <b>Cell Structure and Function:</b> functional role subcellular organelles and functions, cell membrane -fluid mosaic model composition, membrane receptors &amp; membrane systems.</li><li>• <b>Nucleic acids:</b> Components, structure and level of organization, Physico chemical properties, biological importance.</li></ul>
UNIT II	<b>Carbohydrates, Amino acids &amp; Proteins</b> <ul style="list-style-type: none"><li>• <b>Carbohydrates:</b> Classification, structural features, stereoisomerism and optical activity, Physico-chemical properties, hetero-glycans.</li><li>• <b>Amino acids-</b> Classification and structure, Physico-chemical properties, Formation of peptide linkages.</li><li>• <b>Proteins-</b> Structure and organization, Physico-chemical properties, classification and functional diversity of proteins.</li></ul>
UNIT III	<ul style="list-style-type: none"><li>• <b>Lipids:</b> Classification, chemical structure and properties of fatty acids, biological functions of lipids. Triglycerides, phospholipids, glycolipids, Lipoproteins.</li><li>• <b>Enzymes:</b> Classification, nomenclature, general properties of enzyme, regulation of enzyme activity, Enzyme inhibition,</li></ul>

	<ul style="list-style-type: none"> <li>• Definition with examples-Coenzymes, cofactors, , isoenzymes, immobilized enzymes.</li> </ul>
<b>UNIT IV</b>	<p><b>Biochemical Techniques</b></p> <ul style="list-style-type: none"> <li>• <b>Spectroscopic techniques:</b> Principles of colorimeter, spectrophotometer, fluorimeter. Beer-Lambert's Law and its limitations.</li> <li>• <b>Separation techniques: Centrifugation, Ultra centrifugation, Chromatography-</b>Principles, methods and applications.</li> <li>• <b>Electrophoretic techniques: Principle, types and application.</b></li> </ul>

### References

1. Nelson, D.L., Cox, M.M. Lehninger. (2004). Principles of Biochemistry 4th edition Pub WH Freeman Co.
2. Elliott, W.H., Elliott, D.C. Biochemistry and Molecular Biology 3rd Indian edition, Pub. Oxford.
3. Mathews, Van Holde and Ahern, Biochemistry by 3rd edition, Pub Pearson education
4. Stryer, L. Biochemistry 4th Ed. W.H. Freeman and Co. NY.
5. Kuchel, P.W., Ralston Schaums, G.B. Outlines of Biochemistry 2nd edition Pub: Tata.
6. Voet, D., Voet J.G. (2004). Biochemistry 2nd Ed.
7. Devlin, T.M. (1997). Biochemistry with clinical correlations, Wiley-Liss Inc. NY.
8. Zubey, G.L. Parson, W.W., Vance, D.E. (1994). Principles of Biochemistry WmC Brown publishers, Oxford

## SEMESTER ONE

No. of hours/week	Credits
2	2

### SEC 01 - Research methodology & Statistics

#### Course Objectives:

- To understand the basics of research methodology
- To learn the usage of research methodology in nutrition research
- To learn the usage of citation and communication styles in research methodology

#### Course outcomes: At the end of course students will be able to use

- the research techniques, citation style and communication style in nutrition research.
- They will also learn to use different statistical tools in nutrition research.

Unit	Unit content
UNIT I	<b>Fundamentals of research methodology</b> <ul style="list-style-type: none"><li>• Introduction to research methodology: Meaning of Research, Objectives of Research, types of research, Research design – meaning, types of research design, Sources and types of Data – Primary, Secondary and Tertiary.</li><li>• Methods of Collecting Data: Observation, field investigations, Direct studies – Reports, Records or Experimental observations, questionnaire, interview, checklist, rating scale, attitude scale, reliability and validity of tools.</li></ul>
UNIT II	<b>Sampling</b> <ul style="list-style-type: none"><li>• Processing and analysis of data: Editing, coding, classification, tabulation, graphical representation.</li><li>• Sampling methods – probability and non-probability sampling, sampling size, sampling error.</li><li>• Measure of central tendency – mean, median, mode.</li><li>• Measures of dispersion - range, mean deviation, standard deviation. measures of skewness.</li></ul>
UNIT III	<b>Hypothesis testing</b> <ul style="list-style-type: none"><li>• Hypothesis, types of hypothesis, level of significance, type I and type II errors, p-value and its interpretation, degrees of freedom, chi square test, student's t test, f test, one way and two way ANOVA, correlation, Karl-Pearson's coefficient of correlation, simple and multiple linear regression, non-parametric test: Kolmogorov - Smirnov one sample and two sample test,</li></ul>

	Wilcoxon signed rank test, Mann-Whitney U test, Kruskal-Wallis test.
<b>UNIT IV</b>	<b>Citation and ethics</b> <ul style="list-style-type: none"> <li>• Citation and referencing style, ethical standards in research with human participants – institutional review boards, informed consent, risk, deception, debriefing, ethical standards in research with children, ethical standards in research with animals, Plagiarism, interpretation and report writing, use of computer applications in research methodology.</li> </ul>

## References

1. Kothari, CR. (2004). "Research methodology – methods and techniques", New age international publishers, New Delhi.
2. Jackson, LS. (2009). Research methods and statistics – a critical thinking approach, 3<sup>rd</sup> edition, Wadsworth Cengage Learning, Australia.
3. Fink, A., 2009. Conducting Research Literature Reviews: From the Internet to Paper. Sage Publications
4. Leedy, P.D. and Ormrod, J.E., 2004 Practical Research: Planning and Design, PrenticeHall.

SEMESTER ONE

No. of hours/week	Credits
4	2

**Practical 01 - Physiology & Hematology Practical**

**Course Objectives:**

- To differentiate different types of tissues
- To understand the anatomy, locations and functions of different organs
- To learn the working of dialysis machine

**Course outcomes:** At the end of the practical course students will have

- The knowledge of anatomy, function and location of different organs.
- They will also know the working of dialysis machine, ECG and EEG.
- In addition to this they will practically know to estimate the bleeding and clotting time, ESR and PCV rate etc.

Sl.No	Practical
1	Microscopic study of tissues – epithelial tissue, connective tissue, muscular tissue, nervous tissue, and adipose tissue
2	Understanding the anatomy and functions of major organs using working models <ul style="list-style-type: none"><li>• Brain</li><li>• Heart</li><li>• Lung</li><li>• Liver</li><li>• Kidney</li><li>• Pancreas</li></ul>
3	Estimation of erythrocyte sedimentation rate using wintrobe tube method
4	Determination of haematocrit using wintrobe tube or Westergren method
5	Estimation of bleeding time (Duke's method) and clotting time (capillary tube method)
6	Demonstration of dialysis process

**SEMESTER ONE**

No. of hours/week	Credits
4	2

**Practical -02: Nutritional Biochemistry**

Sl No	Practical
1	Determination of the pH of food components
2	Preparation of buffers
3	Demonstration of Beer Lambert's law
4	Proximate composition- Determination of moisture
5	Determination of Ash
6	Determination of Protein
7	Determination of Fat
8	Determination of Glucose and starch
9	Estimation of Ascorbic acid
10	Estimation of Iron & Phosphorus
11	Determine Salivary amylase activity
12	Paper chromatography- separation of plant pigments

**Reference:**

1. Textbook of Medical Biochemistry 8th Edition, M N Chatterjee, Rana Shinde, 2011. Jaypee Brothers Medical Publishers
2. Murray, R.K., Graner, D.K., Mayes, P.A. and Rodwell, VW. (2000) : 25th Ed. Harpers Biochemistry, Macmillan Worth Publishers.
3. Nelson D.L. and Cox, M.M. (2017) : seventh Ed. Leininger's Principles of Biochemistry, Macmillan Worth Publishers.
4. Devlin, T.M. (2010): 7th Ed. Textbook of Biochemistry with Clinical Correlations, Wiley Liss Inc.\
5. Stryer, L. (1998): 4th Ed. Biochemistry, W.H. Freeman and Co.
6. Voet, D. Voet, J..G and Prat, C.W, (2015) : Fundamentals of biochemistry. 4<sup>th</sup> Edition.

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## **Semester Two**

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SEMESTER TWO

No. of hours/week	Credits
4	4

**DSC - 04 - Advanced Nutrition**

**Course Objectives:** The paper deals with

- Metabolism, functions and RDA of vitamins and minerals
- Water distribution and maintenance of balance
- Interaction of drug and nutrient and its effect on nutrient activity.

**Course Outcomes:** By the end of the course the students would be able to understand the

- The impact of vitamin and mineral deficiency and toxicity on the biochemical functions of body
- The interaction of vitamin like molecules with nutrients
- The interrelationship between water and electrolyte balance.
- Effect of drug- nutrient interaction of the functionality of the vital organs of the body.

Unit	Unit content
<b>UNIT I</b>	<ul style="list-style-type: none"> <li>• <b>Vitamins</b> - Discovery of vitamins, Numbering and naming of vitamins, units and measurement of vitamins.</li> <li>• <b>Fat soluble Vitamins:</b> Vitamin A, D, E &amp; K. - Digestion, absorption and transport and excretion, functions, interaction with other nutrients (if any), RDA, Deficiency and toxicity , sources</li> <li>• <b>Water soluble vitamins:</b> Vitamin C, Thiamine, Riboflavin, Niacin, Pantothenic acid, Biotin, Folic acid, Vitamin B12, Vitamin B6 - Digestion, absorption and transport and excretion, functions, interaction with other nutrients (if any), RDA, Deficiency and toxicity, source.</li> </ul>
<b>UNIT II</b>	<p><b>Macro minerals</b></p> <ul style="list-style-type: none"> <li>• <b>Calcium, Phosphorus Magnesium, Sodium, Potassium, Chlorine.-</b> Digestion, absorption and transport and excretion, functions, homeostasis, interaction with other nutrients (if any), RDA, Deficiency and toxicity, major sources.</li> <li>• <b>Micro minerals-Iron, Zinc, copper, selenium, chromium, iodine, manganese, Molybdenum and fluoride:</b> Digestion &amp; absorption, Functions, Toxicity, interaction with other nutrients, RDA and food sources.</li> </ul>
<b>UNIT III</b>	<p><b>Vitamin like molecules &amp; Ultra trace minerals</b></p> <ul style="list-style-type: none"> <li>• <b>Vitamin like molecules:</b> Choline, carnitine, inositol, taurine, flavonoid, pangamate, laetrile PABA – Structure, Functions, sources, deficiency and toxicity, interaction with other nutrients.</li> </ul>

	<ul style="list-style-type: none"> <li>• <b>Ultra-trace minerals:</b> Arsenic, Boron, Nickel, Silicon, Vanadium &amp; cobalt: – Structure, Functions, sources, deficiency and toxicity, interaction with other nutrients.</li> </ul>
<b>UNIT IV</b>	<p><b>Water, Drug-nutrient interaction</b></p> <ul style="list-style-type: none"> <li>• <b>Water-</b> Functions, distribution and compartments of body water</li> <li>• Water requirement, intake, and output.</li> <li>• Regulation &amp; disturbances in fluid balance-Dehydration and Edema</li> <li>• <b>Drug-nutrient interactions</b> – effect of drugs on digestion, absorption and metabolism of nutrients, effect on organ function, drug dosage and efficacy.</li> </ul>

#### References:

1. Modern Nutrition in Health and Disease , Robert J. Cousins PhD (Author), Katherine L. Tucker Ph.D. (Author), Thomas R. Ziegler M.D., 11<sup>th</sup> Edition, 2014.
2. Understanding Normal and Clinical Nutrition, Eighth Edition, Sharon Rady Rolfes, Kathryn Pinna, Ellie Whitney. Wadsworth, Cengage Learning 2009.
3. Advanced Nutrition and Human Metabolism, Sareen S. Gropper, Jack L. Smith, James L. Groff. 2009.
4. Mahan, L.K., Arlin, M.T., (2012): Krause's Food, Nutrition and Diet Therapy, 13th Ed. W.B. Saunders Company, London.
5. Sri Lakshmi B, Nutrition Science, 5<sup>th</sup> Edition, New age International Publishers. 2018.

**SEMESTER TWO**

No. of hours/week	Credits
4	4

**DSC- 05 - Principles of Diet Therapy****Course Objectives:**

- With this paper the students will understand the concept of clinical nutrition, diet planning and dietitian and their responsibilities.
- The paper deals with types of diets and dietary management in various diseased conditions and mal nutritional status.
- The paper deals with importance of nutrition in sports.

**Course Outcome:** At the end of the semester the students will understand the dietitian responsibilities and their role in nutrition care process and diet planning.

Unit	Unit content
<b>UNIT I</b>	<b>Introduction to Clinical Nutrition and Dietetics, Dieticians</b> <ul style="list-style-type: none"><li>• Introduction to clinical nutrition and dietetics: Definition and history of dietetics, Interrelationship between food, nutrition and health. Factors affecting food choices, Concepts of a desirable diet for optimum health, Rationale for nutritional support in an institution, the food guide.</li><li>• Role and responsibility of dieticians: Factors in patient care, team approach in patient care, psychological considerations, interpersonal relationship with patients, importance of nutrition education, medical ethics, Hospital dietary-scope and importance, types of food service, quality management.</li></ul>
<b>UNIT II</b>	<b>Nutrition Care Process &amp; Basic principles of diet planning:</b> <ul style="list-style-type: none"><li>• Nutrition Care Process (NCP) - Nutritional assessment, - History taking, Nutrient intake analysis, anthropometry, usefulness of nutrition laboratory data, assessment of protein – energy status, Nutrition counseling: definition, concept, role of clinical dietitian, the recipient and counseling environment and goals of counseling.</li><li>• Basic principles of planning a normal diet- characteristics of normal diet, meeting nutrient requirement of individuals family and institutions, applications of dietary guidelines for the community, interrelationship between food nutrition and health, factors affecting food choices.</li></ul>

<b>UNIT III</b>	<b>Types of diet and feeding methods</b> <ul style="list-style-type: none"> <li>• Regular diet and rationale for modifications in energy and other nutrients, texture, liquid, soft diets. Analysis of dietary intake, Food and nutrient delivery.</li> <li>• Enteral and parenteral feeding: principles, types, methods of administration, monitoring and complications</li> </ul>
<b>UNIT IV</b>	<b>Eating disorders, Underweight and Obesity</b> <ul style="list-style-type: none"> <li>• Regulation of food intake- hunger, satiety and role of neurotransmitters and hormones</li> <li>• Eating disorders: causes, symptoms, types-Anorexia Nervosa, Bulimia Nervosa, and Binge Eating Disorder, dietary management and Pharmacological treatment.</li> <li>• Types of obesity, Assessment of obesity, Health risks, Regulation of body weight. Causes of obesity, Dietary Management of obesity - Dietary Modification: past and present approach, Psychology of weight reduction.</li> <li>• Underweight / Excessive Leanness – classification, causes, signs and symptoms and dietary management.</li> </ul>

#### References:

1. Robinson, C.H., Lawler, M.R., Chenoweth, W.L., and GarMck, A.E. (1986) Normal and Therapeutic Nutrition. 17th Ed., MacMillan Publishing Co.
2. Williams, S.R. (2013); Basic Nutrition and Diet Therapy, 14th Ed. Times Mirror/Mosby college publishing St. Louis.
3. Raheena, Begum (1989): A Textbook of foods, nutrition and dietetics. Sterling publishers, New Delhi.
4. Joshi, S.A. (1992): Nutrition and Dietetics, Tata McGraw Hi 11 Publications, New Delhi.

SEMESTER TWO

No. of hours/week	Credits
4	4

**DSC 06 - Medical Nutrition Management**

**Course Objectives:**

- The paper deals with the concept of nutrition care for the patients under medical supervision or hospitalized patients.
- The paper deals with the nutrient and drug interaction.
- The paper covers the nutrition therapy for GI tract, pancreas, pulmonary, and liver diseases under medical supervision.

**Course Outcomes::** By the end of the semester the students understand what type of nutritional care process should be followed for the subjects with various disease conditions under medical supervision.

Unit	Unit content
UNIT I	<b>Nutritional care of hospitalized patients, Nutrient and Drug Interaction, immuno enhancers &amp; immuno suppressants</b> <ul style="list-style-type: none"><li>• <b>Hospital malnutrition:</b> impetus for improved nutritional care of patients.</li><li>• <b>Assessment in critical illness:</b> Nutritional screening and assessment of the critically ill. Preparation of nutritional care plan. Life support systems</li><li>• <b>Immuno enhancers &amp; immuno suppressants:</b> Role of immuno enhancers, conditionally essential nutrients, immuno suppressants and special diets.</li></ul>
UNIT II	<b>Medical Nutrition Therapy for Upper Gastrointestinal tract Disorders Pulmonary &amp; Liver diseases – Etiology, Symptoms,</b> <ul style="list-style-type: none"><li>• <b>Oesophagus</b> - Oesophagitis, Gastroesophageal reflux (GERD) dietary management</li><li>• <b>Disorders of stomach:</b> H. pylori infection, Gastric and duodenal ulcers, dietary management.</li><li>• <b>Disorders of Small and Large intestine</b> – Malabsorption syndrome (sprue, ulcerative colitis, Crohn's disease, inflammatory bowel syndrome, Celiac, Flatulence)-dietary management</li><li>• <b>Intestinal surgery:</b> short bowel syndrome, Ileostomy, Colostomy, Rectal surgery, dietary management</li><li>• <b>Pulmonary diseases:</b> Chronic Obstructive Pulmonary Disease, Cystic Fibrosis, Pneumonia, Tuberculosis- causes, pathology, effect of malnutrition, dietary management.</li><li>• <b>Liver diseases:</b> Liver function tests, Hepatitis (A, B,C, Fulminant,) liver cirrhosis-dietary management.</li><li>• Cholecystitis, Cholelithiasis, cholangitis, cholestatic liver disease, inherited disorders, dietary management.</li></ul>

UNIT III	<p><b>Medical Nutrition Support in Metabolic stress &amp; Metabolic disorders</b></p> <ul style="list-style-type: none"> <li>• <b>Cardiovascular Disease:</b> CVD bio markers and interpretation. Metabolic syndrome, long-term and short-term treatment in Coronary disease. Myocardial infarction, cerebral infarction (atherosclerosis as one of the causative factors)</li> <li>• <b>Other acute and chronic conditions:</b> congestive heart failure, hypertension, stroke, dyslipidaemia (genetic hyperlipidaemia).</li> <li>• <b>Diabetes Mellitus:</b> Classification, diagnostic/monitoring criteria, long and short-term management. Drugs in diabetes, calorie counting.</li> <li>• Ketoacidosis, Hypoglycemia of non-diabetic origin.</li> <li>• <b>Phenylketonuria (PKU);</b> Maple Syrup Urine Disease (MSUD); Lactose intolerance; Galactosemia Renal disease - Nephrotic syndrome, Acute and Chronic renal failure- diagnostic procedures and principles of dietary management and dialysis.</li> <li>• <b>Metabolic stress:</b> Sepsis, trauma, burns, surgery, oral and dental health.</li> </ul>
UNIT IV	<p><b>Medical nutrition therapy in Pancreas disorder, Rheumatic disorders &amp; Neurological diseases</b></p> <ul style="list-style-type: none"> <li>• <b>Pancreas disorder:</b> pancreatitis, Functional tests and dietary management.</li> <li>• <b>Rheumatic disorders:</b> Osteo arthritis, rheumatic arthritis, scleroderma, systemic lupus erythematosus.</li> <li>• Gout: Symptoms, causes, treatment, prevention, dietary management.</li> <li>• <b>Neurological diseases:</b> Epilepsy, migraine, Alzheimer's Parkinson's, - causes, effect of malnutrition, feeding problems, role of nutrients early recovery.</li> </ul>

## References

1. Anderson, L., Dibble, M. V., Turkki, P. R., Mitchall, H. S., and Rynbergin, H. J. (1982) Nutrition in Health and Disease, 17th Ed., J. B. Lippincott Co. Philadelphia.
2. Aitia, F. P. (2001): Clinical Dietetics and Nutrition '4th Edition, Oxford University press, Delhi.
3. Mahan, L. K., Arlin, M. T., (2012): Krause's Food, Nutrition and Diet Therapy, 11th Ed. W. B. Saunders Company, London.
4. Robinson, C. H., Lawler, M. R., Chenoweth, W. L., and Liliwick, A. E. (1991) Normal and Therapeutic Nutrition, 17th Ed., MacMillan Publishing Co.
5. Williams, S. R. (2016): Nutrition and Diet Therapy, 15th Ed Times Mirror/Mosby college publishing,
6. Raheena, Begum (1989): A Textbook of foods, nutrition and dietetics. Sterling publishers, New Delhi.
7. Joshi, S. A. (1992): Nutrition and Dietetics, Tata McGraw Hill Publications, New Delhi

## SEMESTER TWO

No. of hours/week	Credits
4	4

### **DSE-01a - Pediatric Nutrition**

#### **Course Objectives**

- To learn the importance of normal growth, development and adequate nutritional support from infancy to adolescence.
- To learn about the dietary modifications and lifestyle management for paediatric disease conditions.

**Course Outcomes:** By the end of the course the student will be able to

- Assess growth & development, nutritional status in the paediatric population.
- Demonstrate understanding of the causes, pathophysiology and clinical features of paediatric diseases conditions.
- To rejuvenate and restore the normal nutritional status in paediatric disease conditions through required dietary modification.

Unit	Unit content
UNIT I	<b>Assessment of normal growth and development</b> <ul style="list-style-type: none"><li>• <b>Growth and development in children</b> – Introduction, Nutritional requirements, weight, height, head circumference, BMI in children, percentile classifications, assessment of body composition, factors affecting normal growth in children, milestones.</li><li>• <b>Nutritional needs</b> - preterm infants, Catch-up growth.</li><li>• <b>Failure to thrive</b> – issues related to nutrition, medical, psychosocial, ecological and intervention.</li></ul>
UNIT II	<b>Dietary Management of critically ill children</b> <ul style="list-style-type: none"><li>• <b>Nutritional support in critically ill children</b> – Introduction, metabolic changes during critical illness, nutritional support.</li><li>• <b>Nutritional requirements in hospitalized children</b> – Calories, proteins, fats, carbohydrates, vitamins, minerals, water, electrolytes and immune nutrients.</li><li>• <b>Total Parenteral Nutrition &amp; Enteral Nutrition</b></li><li>• <b>SAM, PEM</b> - Identification criteria and causes. Resuscitation, Restoration and Rehabilitation of PEM, Pediatric obesity, dietary management.</li></ul>

UNIT III	<p><b>Dietary management in paediatric diseases</b></p> <ul style="list-style-type: none"> <li>• <b>Nutritional support in diarrhea &amp; Constipation:</b> Acute &amp; chronic diarrhoea – Pathogenesis and dietary management, Oral Rehydration Therapy (ORT), Fluid &amp; Electrolyte Therapy.</li> <li>• <b>Juvenile Diabetes</b> - Metabolic changes in Juvenile Diabetes, nutrient requirement, Medical Nutrition Therapy, insulin regime and diet plan, Exercise and hypoglycemia. Complications of Diabetes – hypoglycemia, diabetic ketoacidosis, Somogyi &amp; dawn effect.</li> <li>• <b>AIDS</b> - Effect of HIV on nutritional status, role of nutrition and nutritional requirements for HIV infected child, Effect of Anti-Retroviral Therapy (ART), feeding of HIV exposed child, breast feeding, replacement feeding.</li> </ul>
UNIT IV	<p><b>Dietary management in cancer and special conditions</b></p> <ul style="list-style-type: none"> <li>• <b>Cancer:</b> Medical nutrition therapy, tube feeding, parenteral nutrition, relationship between diet and cancer.</li> <li>• <b>Allergies and intolerance:</b> Pathogenesis and types of allergic reactions – Type I hypersensitivity, Type II hypersensitivity, Type III immune complex reaction, Cell mediated reaction.</li> <li>• <b>Common food allergens and manifestations</b> – skin, respiratory tract, GI (milk, egg, soy, fish, shellfish, peanuts). Diagnosis, treatment and dietary management.</li> <li>• <b>Inborn errors</b> – diagnosis and dietary management: CHO – glycogen storage disease, galactosemia, fructosemia. Proteins – PKU, MSUD, Alkaptonuria, Homocystinuria, Tyrosinemia, Minerals – Wilson's disease.</li> <li>• <b>Nutrition for children with special needs:</b> Ketogenic diet – Epilepsy, Neutropenic diet – bone marrow transplant, Autism.</li> </ul>

### References

1. Madhu Sharma, Paediatric Nutrition in Health and Disease, 1<sup>st</sup> Edition, Jaypee Brothers Medical Publishers (P) Ltd., New Delhi, 2013
2. Kleinman R.E., Paediatric Nutrition Handbook, 7<sup>th</sup> Edition, American Academy of Paediatrics, 2013.
3. K. E. Elizabeth, Fundamentals of Paediatrics, 2<sup>nd</sup> Edition, Paras Publishers, Hyderabad, 2002
4. Meenakshi N. Mehta, Nitin J. Mehta, Nutrition and Diet for Children Simplified, 1<sup>st</sup> Edition, Jaypee Brothers Medical Publishers (P) Ltd., New Delhi, 2014
5. Suraj Gupta (Ed), Recent advances in Paediatrics – Nutrition, Growth and Development, Special Volume 20, Jaypee Brothers Medical Publishers (P) Ltd, New Delhi, 2010.
6. Clinical Dietetics Manual- Indian Dietetic Association, New Delhi, 2011.



**SEMESTER TWO**

No. of hours/week	Credits
4	4

**DSE -01b- Geriatric Nutrition****Course Objectives:**

- To teach the importance of nutrition in delaying the aging and disease conditions.
- Management of non-communicable diseases and maintaining the nutritional status through balanced diet.
- Importance of physical activity along with the nutrition during to delay the disease conditions.

**Course Outcomes:** By the end of the course the student will be able to understand the

- Dietary requirements during the process of ageing and chronic disease condition.
- Lifestyle to be followed for the prevention and management of disease conditions.
- Psychosocial factors and physical activity influencing the nutritional status

Unit	Unit content
<b>UNIT I</b>	<b>Concept of Geriatric</b> <ul style="list-style-type: none"> <li>• Definition of Geriatric, Behavior, Social situation, Knowledge and belief, Nutritional Assessment of the elderly, Physiological changes in ageing, Socio-psychological and metabolic aspects of elderly.</li> </ul>
<b>UNIT II</b>	<b>Health status of the Elderly</b> <ul style="list-style-type: none"> <li>• Etiopathogenesis and management of the elderly, Prevention and control of chronic degenerative diseases, Lifestyle, and chronic disease management of the elderly.</li> </ul>
<b>UNIT III</b>	<b>Nutrition in Elderly</b> <ul style="list-style-type: none"> <li>• Factors influencing food and nutrient intake, Nutritional requirements and dietary modification, Enteral and Parenteral nutrition support, Complications of nutritional support system including re-feeding syndrome and rehabilitation diets, Types of feeds, advantages and disadvantages of home-based feed.</li> </ul>
<b>UNIT IV</b>	<b>Public health aspects on Geriatric stages</b> <ul style="list-style-type: none"> <li>• Psychosocial factors, eating disorder, physical activity, Elderly nutrition and health related problems in India, Institutionalization, Criteria by WHO, Policies and education programmes of the government and NGO sector pertaining of the elderly in India.</li> </ul>

**References:**

1. Bennion, H. (1979) *Clinical Nutrition*, New York Harper and Raw Publishers.
2. Brown, J. E., Sugarman, I. J. (2002). *Nutrition through the Life Cycle*, Wadsworth Thomson Learning.
3. Goodhart, R. S. S. and Shils, M. E. (1998). *Modern Nutrition in Health and Disease*. Philadelphia: Lea and Febiger.
4. Groff, J. L and Gropper, S. S. (1999). *Advanced Nutrition and Human Metabolism*, Belmont CA: Wadsworth/Thomson Learning.

## **DSE 01c- Nutraceuticals & Functional Foods**

**Course Objectives:** The paper deals with the concept of nutraceuticals and functional foods,

- their role in disease prevention and management.
- the role of phytochemicals in preventing metabolic disorders.

**Course Outcomes:** At the end of the semester the students will be able to appreciate

- the significance of nutraceuticals in maintaining health
- to incorporate them as functional ingredient in food formulations for disease prevention.

Unit	Unit content
UNIT I	<b>History and Classification of Nutraceuticals</b> <ul style="list-style-type: none"><li>• Nutraceutical and Functional foods – Definitions, formulations and challenges</li><li>• History and status of functional foods</li><li>• Teleology of nutraceuticals</li><li>• Classification and organization model of Nutraceuticals</li></ul>
UNIT II	<b>Plant metabolites as Nutraceutical</b> <ul style="list-style-type: none"><li>• <b>Primary and secondary metabolites in plants</b> – a) Vitamins b) Carotenoids c) Conjugated linolenic acid d) Flavonoids e) Amino acid Omega – g) 3 PUFA f) Terpenoids.</li><li>• <b>Mechanism of action</b> – Anticancer, influence on blood lipid profile, antioxidant, anti-inflammatory and osteo genetic properties</li><li>• <b>Proteins, modified proteins, Starch, cellulose, hemicelluloses, hydrocolloids and gums-</b> functional properties</li></ul>
UNIT III	<b>Functional foods</b> <ul style="list-style-type: none"><li>• Organic components present in food, Vegetables, Cereals, milk and dairy products as Functional foods. Spices and herbs as potential sources of nutraceuticals</li><li>• Nutraceuticals with animal origin- Chondroitin, Glucosamine, Chitin and Chitosan and Choline; mineral origin- Iodine, iron, magnesium, manganese, molybdenum, phosphorus, potassium, selenium, zinc</li></ul>
UNIT IV	<b>Pharmacology of Nutraceuticals</b> <ul style="list-style-type: none"><li>• <b>Nutraceuticals- safety quality assurance and cost</b> — bioavailability: definition, factors affecting bioavailability, micro and biological testing.</li><li>• <b>Pharmacology of nutraceuticals</b> — definition of pharmacological characterization, pharmacological profile tests; safety and toxicological tests.</li></ul>

## References

1. Natural Antioxidants in Human Health and Disease, Balz Frei, Elsevier, 2018.
2. Handbook of Nutraceuticals and Functional Foods, Robert E C ed Wildman, 2016.CRC press.
3. Functional Foods and Nutraceuticals, Aluko Rotimi Aluko, 2012, New India Publishing Agency.
4. Handbook Of Nutraceuticals Yashwant Vishnu pant Pathak, 2011, CRC Press.
5. Nutraceuticals and Functional Foods in Human Health and Disease Prevention, Debasish Bagchi, Harry G. Preuss, Anand Swaroop, 2015., CRC press.

## SEMESTER TWO

No. of hours/week	Credits
2	2

### DSE 02a. Sports Nutrition

**Course Objectives:** The paper deals with an appreciation of the field of exercise and will help understand

- the concept of physical activity, work, sports, and sports nutrition, relationship between nutrients and physical activity/sports.
- body composition and its assessment tools or methods which will help the student to counsel better

**Course Outcomes:** By the end of the semester the student will be able to understand

- basic concept of sports nutrition, the relationship between the macronutrient metabolisms
- physical activity. Role of tools in maintaining the body composition of a sports person.

Unit	Unit content
UNIT I	Introduction to Sports Nutrition, Types of activity based on intensity, benefits of physical activity, factors affecting physical activity, physical fitness, health related and performance related fitness, quantification of intensity of exercise, definition of nutrients, nutrition, sports nutrition and role of nutrition in sports, its importance in increasing sports performance.
UNIT II	Role of nutrients in sports performance; macro and micronutrients, carbohydrates, fats, proteins, minerals and vitamins, definition, classification, sources, RDA, functions, role of nutrients in sports performance, glycaemic load and glycaemic index.
UNIT III	Body composition and assessment methods, Definition of Body Composition, its importance, Determinants of Body Composition, models of body composition, tools like anthropometry, bio impedance, dxa and other methods, desirable body fat percentage, ideal body weight, overweight and obesity.
UNIT IV	<b>Hydration, ergogenic aids,</b> Assessment on dietary, physical fitness, biochemical and clinical status, Nutritional Counselling techniques in sports. Somatotyping. Kinanthropometry.

#### References:

1. Lanham SA, Stear SJ, Shirreffs SM, Collins AL, (2011), Sports and Exercise Nutrition, A John Wiley & Sons, Ltd., Publication.
2. Winter EM, Jone AM, Davison RCR, Bromley PD and Mercer TH, (2006), Sports and Exercise Physiology Testing -guidelines, The British Association of Sport and Exercise Sciences Guide Volume II: Exercise and Clinical Testing.
3. Belski R, Forsyth A, Mantzioris E, (2019), Nutrition for sports, exercise and performance. A Practical guide for students, sports, enthusiasts and professionals. 1<sup>st</sup> Edition. A&U Academic
4. McGinnis PM, (2013), Biomechanics of Sport and Exercise, 3rd edition, Human Kinetics publishers.

## SEMESTER TWO

No. of hours/week	Credits
4	4

### DSE -02b- Molecular Nutrition

#### Course Objectives:

- To teach the basics of physiological and molecular aspects of nutrition.
- To teach relationship between the nutrigenomics and molecular nutrition
- Role of nutrients in gene expression

#### Course Outcomes: By the end of the course the student will be able to understand the

- Importance of omics and interrelationship between Genomics, Epigenomics, Transcriptomics etc.
- Influence of the macro and micronutrients on immune function, gene expression with mechanism.

Unit	Unit content
UNIT I	<ul style="list-style-type: none"><li>• Introduction to biochemical, physiological and molecular aspects of nutrition.</li><li>• Molecular Physiology of Plasma Membrane Transporters for Organic Nutrients Nutrient Homeostasis in Proliferating Cells</li><li>• Interaction of nutrients, gene regulations and performances</li></ul>
UNIT II	<b>Nutrigenomics and Molecular Nutrition</b> <ul style="list-style-type: none"><li>• Introduction to Omics-<ul style="list-style-type: none"><li>○ Nutri-informatics</li><li>○ Genomics</li><li>○ Epigenomics</li><li>○ Transcriptomics</li><li>○ Proteomics</li><li>○ Metabolomics</li></ul></li></ul>
UNIT III	Roles for nutrients in signal transduction, gene expression and proteolysis <ul style="list-style-type: none"><li>• Glucose Regulation of Gene Expression in Mammals</li><li>• Amino Acid-dependent Control of Transcription in Mammalian Cells</li><li>• Fatty Acids and Gene Expression</li><li>• Assembly of Triglyceride-transporting Plasma Lipoproteins</li><li>• Regulation of Cellular Cholesterol</li></ul>
UNIT IV	<ul style="list-style-type: none"><li>• Molecular Events and Physiology</li><li>• Nutrition and Immune Function<ul style="list-style-type: none"><li>○ Molecular Mechanisms of Food Allergy</li><li>○ Safety Assessment of Genetically Modified Foods</li><li>○ Methods in modern nutrition research</li></ul></li></ul>

#### References

1. Carlberg, Carsten, Ulven, Stine Marie, Molnár, Ferdin and Nutrigenomics, Springer International Publishing, 2016.
2. Marie A. Caudill and Martha H. Stipanuk, , Physiological, and Molecular Aspects of Human Nutrition, Elsevier, 2018
3. Mark Lucock, Molecular Nutrition and Genomics, nutrition & ascent of human kind, 2007, John Wiley& Sons

## SEMESTER TWO

No. of hours/week	Credits
4	4

### DSE 02C Research Methods in Clinical Nutrition

#### Course Objectives:

- To make students to understand the importance of research in the clinical nutrition
- To teach regulations to be followed in clinical methods in the development of therapeutic diets

#### Course Outcomes: By the end of the course the student will be able to understand the

- Concept involved evidence-based research in the field of clinical nutrition.
- Guidelines and best practices in developing the product with the clinical evidence.

Unit	Unit content
UNIT I	<ul style="list-style-type: none"><li>• Introduction to research methodology and clinical nutrition.</li><li>• Principles of research – Introduction to research and evidence-based practice, scientific literature and peer-review process. Research problem: Definition, selection of research problem, Justification and Limitations. Hypothesis: Definition, sources, characteristics, importance, formation of hypothesis.</li></ul>
UNIT II	<ul style="list-style-type: none"><li>• Research terminologies - Subjects: control and experimental group. Placebo, placebo effect. Variables, correlation and validity. Formulation of research proposal.</li><li>• Research methods – a. Descriptive: correlation, case-control, cross-sectional surveys, b. Experimental: clinical/intervention trials, randomized controlled, single-blind and double blind.</li></ul>
UNIT III	<ul style="list-style-type: none"><li>• Analytical studies: observational, case-control, cohort studies-retrospective and prospective.</li><li>• Sampling methods and sample size. Nutrition Intervention studies – pilot study, randomized controlled trial, nutritional biomarkers.</li></ul>
UNIT IV	<ul style="list-style-type: none"><li>• Regulations and guidelines- Indian Good Clinical Practice guideline (GCP), Clinical Trials Registry of India (CTRI).</li><li>• Ethical guidelines of ICMR (risks and benefits, informed consent). Best practices for Food clinical trials.</li></ul>

#### References

1. Leanne Hodson (Editor), Sangita Sharma (Editor), Julie A. Lovegrove (Editor), eNutrition Research Methodologies, Wiley Blackwell, 2015
2. Mohit Bhandari and Parag Kantilal Sancheti Clinical Research Made Easy: A Guide, JPB, 2010.

SEMESTER TWO

No. of hours/week	Credits
2	2

**SEC-03: Personalized Nutrition**

**Course Objectives**

- To understand the basic concepts of personalized nutrition & nutrigenomics.
- To know the effect of nutrients on gene expression.

**Course Outcomes:** The student will be able to

- Understand the importance of nutrigenomics and gene-nutrient interactions.
- Understand how to utilize nutrigenomics as a strategy for preventive therapy

Unit	Unit content
UNIT I	<b>Introduction to Nutrigenomics</b> <ul style="list-style-type: none"><li>• Definitions - Nutrigenomics, Metabolomics, Proteomics, Pharmacogenomics and Transcriptomics</li><li>• Inter-relation between, nutrient-gene interactions, nutrigenomics and non-communicable diseases</li><li>• Impact of nutrigenomics – nutrition research, nutrition therapy, food industry and nutrition policy</li></ul>
UNIT II	<b>DNA: The Epigenome and Epigenetics</b> <ul style="list-style-type: none"><li>• RNA &amp; DNA – Structure, Function, encrypting &amp; decrypting codes</li><li>• Epigenome – Definition, Gene control of cell growth &amp; division, gene location, gene family, single nucleotide polymorphisms.</li><li>• Advances in DNA sequencing, inheritance of genetic conditions, gene mutations.</li><li>• Basic concept of Southern Blot and Northern Blot study in connection with nutrigenomics.</li></ul>
UNIT III	<b>Gene–Diet Interactions</b> <ul style="list-style-type: none"><li>• Influence of Macro, Micronutrients and Nutraceuticals on gene expression.</li><li>• Different approaches of Nutrient – Gene interactions, Possible models for such interaction.</li><li>• Nutrigenetics and Nutrigenomics: Importance of Functional foods and Personalized nutrition.</li></ul>
UNIT IV	<b>Modifying Disease Risk through Nutrigenetics and Nutrigenomics</b> <ul style="list-style-type: none"><li>• Modulating the risk of NCD's – weight management, diabetes, cardio-vascular</li></ul>

	<p>diseases through nutrigenomics, oxidative stress</p> <ul style="list-style-type: none"> <li>• Fetal origins of adult disease – nutritional basis and genetic link – intrauterine nutrition birth weight, maternal nutrition, Barker's hypothesis</li> </ul>
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## References

1. Carlberg, Carsten, Ulven, Stine Marie, Molnar, Ferdinand. Nutrigenomics, Springer International Publishing, 2016.
2. Kussmann M, Stover PJ, editors. Nutrigenomics and proteomics in health and disease: towards a systems-level understanding of gene-diet interactions. John Wiley & Sons; 2017 May 8.



## SEMESTER TWO

No. of hours/week	Credits
4	2

### Practical-03 Diet Therapy

#### Course Objectives

- With this paper the students will understand the concept of clinical nutrition, diet planning and dietitian and their responsibilities.
- The paper deals with types of diets and dietary management in various diseased conditions and mal nutritional status.

#### Course Outcomes:

At the end of the semester the students will understand the dietitian responsibilities and their role in nutrition care process and diet planning.

Sl No	Practical
1	Grouping of foods according to ICMR classification
2	Standardization of Recipe using the Food Exchange lists
3	Preparation of Desired Dietary Pattern (DDP) table, Total Energy and Nutrient requirement calculation for Healthy and hospitalized persons.
4	Assessing Nutrition status using Standard tool. Eg: SGA, PG-SGA, KDOQI, SOAP, NRS, MINI. MUST
5	Planning and preparation of Modified diets for specific disease conditions - 1. Preparing nutrient and texture modified diets – Routine high calorie and high protein, high fiber, Clear liquid diet, Liquid diet, Soft diet, Semi solid diet. 2. Planning diet for Underweight, Obesity, Anaemia, Vitamin A, SAM and PEM 3. <b>Diet in fevers and infections</b> – Typhoid, Malaria and Tuberculosis. 4. <b>Planning and preparation of diet for</b> –Dyslipidemia, Peptic Ulcer, Hepatitis, cirrhosis, pancreatitis, Diabetes mellitus, acute renal failure, Chronic renal failure, dialysis

#### References:

1. Robinson, C.H., Lawler, M.R., Chenoweth, W.L., and GarMck, A.E. (1986) Normal and Therapeutic Nutrition. 17th Ed., MacMillan Publishing Co.
2. Williams, S.R. (2013); Basic Nutrition and Diet Therapy, 14th Ed. Times Mirror/Mosby college publishing St. Louis.
3. Raheena, Begum (1989): A Textbook of foods, nutrition and dietetics. Sterling publishers, New Delhi.
4. Joshi, S.A. (1992): Nutrition and Dietetics, Tata McGraw Hi 11 Publications, New Delhi.

**SEMESTER TWO**

No. of hours/week	Credits
4	2

**PRACTICAL 04: Enteral & Parenteral Nutrition****Course objectives:**

- Enable students to understand advances in clinical nutrition, emerging modes of enteral and parenteral therapy.
- Emphasize the role of nutrition in the prevention and management of chronic disease conditions.

**Course outcome:**

- The students will learn the principles and planning of enteral and parenteral feeds and selected disease conditions.

Sl No	Practical
1	Nutrient requirement calculation for hospital induced malnutrition and critically ill patients
2	Planning and Preparation of Enteral feeds - Commercial & Kitchen based
3	Nutritional Composition of Parenteral feeds
4	Diet and MNT for following conditions with case study – a. Pre & Post Surgical conditions b. Burns and Trauma
5	Nutrient evaluation and Feed composition of Commercial Enteral and Parenteral feeds
6	Updating the recent trends in NCP by subject expert, through special lectures.

**References:**

1. Robinson, C.H., Lawler, M.R., Chenoweth, W.L., and GarMck, A.E. (1986) Normal and Therapeutic Nutrition. 17th Ed., MacMillan Publishing Co.
2. Williams, S.R. (2013); Basic Nutrition and Diet Therapy, 14th Ed. Times Mirror/Mosby college publishing St. Louis.
3. Raheena, Begum (1989): A Textbook of foods, nutrition and dietetics. Sterling publishers, New Delhi.
4. Joshi, S.A. (1992): Nutrition and Dietetics, Tata McGraw Hi 11 Publications, New Delhi.

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## **Semester Three**

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### SEMESTER THREE

No. of hours/week	Credits
4	4

#### DSC :07 Therapeutic Nutrition

##### Course Objectives

1. To understand the principles and planning of different types of therapeutic diets.
2. To integrate nutrition into healthcare for achieving nutrition care plan goals in target population.

**Course Outcome:** The student will be able to -

1. Understand the importance of nutrient and diet plan for specific disease or disorders.
2. Understand how to utilise the diet therapy as preventive therapy and disease management.

Unit	Unit content
UNIT I	<b>Introduction to Therapeutic Nutrition</b> <ul style="list-style-type: none"><li>• Introduction to Therapeutic nutrition, Medical Terminologies, Usage of International Dietetic terminologies.</li><li>• Planning and basis of nutrient calculation for Routine Hospital diet and Therapeutic diets (Nutrient and Texture modified).</li><li>• Indication for Special diets – Principles, Planning with case studies – DASH diet, KETO diet, Neutropenic, Atkin's, FODMAP, FAD diet, Gout diet, Paleo diet, Diet for Lactose and Gluten intolerance, Detox Diet.</li></ul>
UNIT II	<b>Enteral and Parenteral feeding</b> <ul style="list-style-type: none"><li>• Indications, Methods of Administration and Monitoring.</li><li>• Enteral and Parenteral feeds for pediatric patients, GI condition, Neurological condition.</li><li>• Complications associated with Palliative care – Feeding problems, Re-feeding syndrome.</li><li>• Interactions in Patients Receiving Enteral &amp; Parenteral Nutrition – Factors contributing to interactions,<ul style="list-style-type: none"><li>– Enteral feeding site (gastric, duodenal, jejunal), drug form.</li><li>- Parenteral – Parenteral feed infusion compatibility and stability, Influence of PN on drug action related to glucose homeostasis.</li></ul></li></ul>

<b>UNIT III</b>	<b>Dietary principles and management of special conditions with case studies</b> <ul style="list-style-type: none"> <li>• Protein and energy malnutrition (hospital and domiciliary treatment)</li> <li>• Protein-sparing action of carbohydrates, Water and Electrolyte balance.</li> <li>• Intestinal Brush border deficiencies (Acquired Disaccharide Intolerance), Foods stimulating G. I. Secretion</li> <li>• Febrile diseases- Metabolism, Diet in acute and chronic fevers (Eg: Typhoid and Tuberculosis).</li> <li>• Inborn errors of carbohydrate and protein metabolism.</li> </ul>
<b>UNIT IV</b>	<b>Management of High Risk Conditions with case studies:</b> Patho-physiological, clinical and metabolic aspects of condition <ul style="list-style-type: none"> <li>• Burns, Cardio Vascular Complications, Surgery, AIDS.</li> <li>• Multiple Organ Failure, Chronic Renal Failure (CRF), Dialysis.</li> <li>• Transplant, Trauma and Sepsis, Dumping syndrome.</li> </ul>

### References

1. Robert D.Lee and David CN (2010) Nutritional assessment 5th edition McGraw Hill Higher Education.
2. Boullata, J. I., & Armenti, V. T. (Eds.) (2004). Handbook of Drug' Nutrient Interactions. Springer Science & Business Media.
3. Escott-Stump, S. (2008). Nutrition and diagnosis-related care. Lippincott Williams & Wilkins.
4. Whitney, E. N., Cataldo, C. B., & Rolfes, S. R. (1998). Understanding normal and clinical nutrition. Wadsworth Publishing Company, Inc.
5. Robinson. HC et al., (1986) Normal and therapeutic nutrition (17th edition), Macmillan publishing company.

### SEMESTER THREE

No. of hours/week	Credits
4	4

#### DSC 08 – Community Nutrition

##### Course Objectives:

- The paper deals with nutritional problems prevailing in community.
- The paper covers intervention programs and nutritional policies implemented by government to overcome the nutritional problems.
- The organizations working concerned with food and nutrition in India and globally.

**Course Outcomes:** At the end of the semester the students will be understanding the

- nutritional problems, nutritional education, nutritional assessment
- policies followed in preventing nutritional problems.

Unit	Unit content
UNIT I	<b>Common nutritional problems and malnutrition</b> <ul style="list-style-type: none"><li>• Relationship of nutrition to development -In terms of socio economic, industrial and agricultural development.</li><li>• Consequences of malnutrition and prevalence of common nutritional problems - PEM, vitamin A deficiency disease, anemia, iodine deficiency disorders and fluorosis.</li><li>• Etiological factors leading to malnutrition, Synergism between malnutrition and infection. Measures to overcome malnutrition.</li><li>• Epidemiology of communicable disease: Factors responsible for the spread of communicable diseases, mode of transmission - chicken pox, typhoid fever, malaria, leprosy, filariasis</li></ul>
UNIT II	<b>Nutrition Education &amp; Methods of Assessment of nutritional status</b> <ul style="list-style-type: none"><li>• Nutrition Education: Its importance to the community. Qualities of training workers in nutrition education programs, integration of nutrition with education and extension work. Methods of education, when to teach, whom to teach.</li><li>• Principles of planning, executing and evaluating nutrition education programs, problems of nutrition education</li><li>• Direct method - Anthropometry, biochemical, biophysical and clinical assessment.</li><li>• Indirect method – Dietary Survey, Vital statistics.</li></ul>
UNIT III	<b>Nutrition Intervention programs &amp; National Nutrition policy</b> <ul style="list-style-type: none"><li>• Nutrition Intervention programs in India: Genesis objectives and operation of National Anemia Control Prophylaxis Program, National Goiter Control Program, Vitamin A Prophylaxis Program, School Lunch Program, CMNMP, ICDS, TINP.</li><li>• National Nutrition policy - thrust areas and implementation at national level Impact of national policy on food security.</li><li>• Primary health center (PHC) - Concept, organization, status in India and delivery of service, Taluk level hospital, and employees state insurance (ESI) and immunization</li></ul>
UNIT IV	<b>National &amp; International organization concerned with food and nutrition</b> <ul style="list-style-type: none"><li>• National - ICMR, CHEB, CSWB, SSWB, NIN, NNMB, CFTRI, DFRL, NIPCCD, ICAR – objectives and functions.</li><li>• International - FAO, WHO, UNICEF, objectives and functions.</li><li>• International - World Bank, FFHC, UNESCO, DANIDA- objectives and functions</li></ul>

## References

1. Vinodini Reddy., pralhad raj., Gowrinath sastry, J find Kashinath, K.C. (1993), Nutrition Trends in India, NIN, Hyderabad.
2. Park and park (1995), Textbook of preventive and social medicine, Banarsidas published by Jabalpu.
3. Jelliffee, D.D and Pathes (1989), Assessment of Nutritional status of community, WHO, Geneva.
4. Proceeding of the Nutrition society of India (1999), Vol (35,42,43,44,46 and 47), NIN, Hyderabad.
5. Sarah Gopalam (1996), Towards better Nutrition for women and children problems and programs, Development of women and child development Government of India.
6. Bagehi, K (1987), Evaluation of nutrition education nutrition monitoring and assessment, Editors - Gopaldas, T and Seshadris, Oxford University press.



No. of hours/week	Credits
4	4

### SEMESTER THREE

#### **DSC – 09 Diet in Endocrine disorders**

##### **Course Objectives:**

- To understand the basics of endocrinology
- To learn different nutritional endocrinal disorders
- To learn the diet therapy for endocrinal disorders

##### **Course outcomes:**

- At the end of the course students will know the basic endocrinology and be able to use the concepts of nutrition in the management of endocrinal disorders.
- They will also understand the importance of different diet in the management of endocrinal disorders.

Unit	Unit content
<b>UNIT I</b>	<b>Endocrine glands</b>  1. Introduction to endocrinology, Anatomy of endocrine glands - Hypothalamus, pituitary gland, adrenal glands, thyroid, parathyroid, thymus, pancreas, ovaries, pineal gland, testes. Endocrine cells of gastrointestinal tract. Endocrine cells of kidney.
<b>UNIT II</b>	<b>Physiology of Endocrinal Hormones</b>  2. Hormones - classification of hormones, mechanism of action of hormones, neural and endocrinal relationship. Physiology of regulators of sugar and energy metabolism – insulin and glucagon, regulators of food intake – leptin and ghrelin, digestive tract hormones – gastrin, cholecystokinin, secretin, vasoactive intestinal peptide (VIP), Glucose-dependent insulinotropic polypeptide (GIP). Neuropeptides in the enteric nervous system - endorphins and enkephalins, tachykinins, gastrin-Releasing Peptide.
<b>UNIT III</b>	<b>Management of Endocrine disorders</b>  3. Causes, signs, symptoms and dietary management of nutritional thyroid disorders – goiter, hypo and hyperthyroidism, mental retardation, nutritional bone disorder – osteomalacia, osteoporosis, rickets and fluorosis. Nutritional metabolic disorders – diabetes, fibrocalcific pancreatic disease. Nutritional gonadal disorder- gonadism, Pubertal disorders - PCOS, amenorrhea, growth hormone disorders.
<b>UNIT IV</b>	4. Ketogenic diet in endocrine disorders, dietary management for endocrine

	disorders in children, amino acids in endocrine systems, Diagnostic tests and indicators of endocrine disorders, endocrine disrupting chemicals, source of endocrine disrupting chemicals in food system, effect of endocrine disruptors - Anti-estrogenic, Anti-androgenic, Anti-thyroid, Anti-progestin.
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#### References:

2. Sembulingam, K and Prema Sembulingam. (2012). "Essentials of Medical Physiology", 6th edition, Jaypee Publications.
3. Tortora, JG and Derrickson B. (2017). "Principles of ANATOMY & PHYSIOLOGY," Johny Wiley and Sons Publication.
4. Kleine B & Rossmanith W.G. (2016). "Hormones and the Endocrine System – Textbook of endocrinology," Springer International Publishing company, Switzerland.

### SEMESTER THREE

No. of hours/week	Credits
4	4

#### DSC 03a Nutrition for Hepatic & Renal Disorders

##### Course Objective-

- To understand the importance of adequate nutrition for maternal and child health.
- To know the growth and developmental changes during pregnancy, infancy till adolescence.

##### Course Outcomes : At the end of the course students will be able to,

- Understand the basics of maternal & child nutrition and factors effecting nutrition and health outcomes.
- To plan normal diet and manage the nutritional support for better maternal & child health outcomes.

Unit	Unit content
UNIT I	<b>Pathophysiology and Nutritional assessment of hepatic disease</b> <ul style="list-style-type: none"><li>• Introduction to hepatic physiology, Pathophysiology &amp; diagnosis of hepatic disorders/diseases.</li><li>• Nutritional assessment in hepatic disease – Anthropometry, Clinical, Biochemical &amp; dietary assessment and Guidelines<ul style="list-style-type: none"><li>• Factors effecting nutritional status during hepatic disorder/disease.</li><li>• Nutritional screening – Nutritional Screening tools, Biomarkers. Drug-Nutrient Interaction, Bioavailability of nutrients.</li></ul></li></ul>
UNIT II	<b>Nutritional management of hepatic diseases / disorders</b> <ul style="list-style-type: none"><li>• Nutritional Recommendations for hepatic diseases and end-stage liver failure.</li><li>• Nutritional needs &amp; support for children with chronic liver disease, Liver cirrhosis, Insulin resistance, Gastrointestinal bleeding, Ascites, Inflammation/Infection, Hyponatremia.</li><li>• Liver and Drug metabolism: Drug induced liver injury (DILI), Alcoholic liver disease, Metabolic liver diseases, NAFLD/NASH, Wilson's disease.</li></ul>
UNIT III	<b>Pathophysiology and Nutritional assessment of renal diseases</b> <ul style="list-style-type: none"><li>• Introduction to Kidney physiology, Pathophysiology &amp; diagnosis of renal disorders/diseases, Stages of renal disease / disorders, Epidemiology of Kidney disease globally and in India.</li><li>• Nutritional assessment in kidney disease – Anthropometry, Clinical, Biochemical &amp; dietary assessment.</li><li>• Factors effecting Nutritional status during renal disorder/disease.</li><li>• Nutritional screening – Nutritional Screening tools, Biomarkers. Drug-Nutrient Interaction, Bioavailability of nutrients.</li></ul>
UNIT IV	<b>Nutritional management of renal diseases /disorders</b> <ul style="list-style-type: none"><li>• Medical Nutrition Therapy - renal disease induced malnutrition, Nutrition Support in End-stage Renal Disease, Hemodialysis and Peritoneal Dialysis Patients. Nutritional management of renal transplant.</li><li>• Management of obesity, diabetes and hypertension in CKD, Additional</li></ul>

	Nutritional Considerations in Kidney Disease - Dietary Supplements, Nutrition education & counselling.
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#### References:

1. Nutrition and Liver Disease-Special Issue, Pietro Vajro and Claudia Mandato (Eds.), MDPI, 2018.
2. Nutrition, diet therapy, and the liver. Preedy VR, Lakshman R, Srirajaskanthan R, Watson RR. CRC Press; 2009.
3. Assessment of nutritional status in renal diseases. Handbook of nutrition and the kidney. Goldstein DJ. 1998(Ed. 3).
4. Yang J, He W, editors. Chronic Kidney Disease: Diagnosis and Treatment. Springer Nature; 2019 Nov 8.

### SEMESTER THREE

No. of hours/week	Credits
4	4

#### **DSE 03B. Nutrition in Cancer & inflammation**

**Course Objectives:** The objective of the paper is understanding the physiological mechanism behind cancer, inflammation and the role of nutrition in inflammation.

**Course Outcomes:** The student will get acquainted with the concept of cancer, inflammation and inflammatory diseases and the role of nutrition in managing the diseases and disorders.

Unit	Unit content
UNIT I	<ul style="list-style-type: none"><li>• Epidemiological considerations in cancer, nature and metabolism of cancer and nutrition, cancer and phytonutrients, precision oncology and nutrition, epidemiology of nutrition, diet and cancer risk, Physiologic changes during cancer - adipose tissue, skeletal muscles.</li><li>• Endocrine and Paracrine Factors in Carcinogenesis, Principles of Tumor Immunology, Assessing Endocrine Effects of Cancer and Ectopic Hormone Syndromes. Environmental factors and cancer risk.</li></ul>
UNIT II	<ul style="list-style-type: none"><li>• Cancer and hormones- risk and progression, malnutrition and cancer cachexia, nutrition and chemotherapy - in epidemic of obesity,</li><li>• Cancer survivors and nutrition- Lifestyle changes and behavioral approaches, Nutritional Assessment and Support of the Cancer Patient, Evidence-based Practice Management in Cancer Prevention and Treatment</li></ul>
UNIT III	<ul style="list-style-type: none"><li>• Inflammation, definition, causes, mechanism of inflammation, activation of inflammatory pathway, immune components of inflammation, biomarkers of inflammation, Acute and chronic inflammation, organ specific inflammatory response, role of food in inflammation.</li><li>• Inflammatory response in Rheumatic arthritis and psoriatic arthritis, Inflammatory bowel syndrome, celiac disease, Allergy, asthma, obesity, endometriosis causes, symptoms, complications, dietary management.</li></ul>
UNIT IV	<ul style="list-style-type: none"><li>• Stress, oxidative stress, stress response, common pathway for stress related diseases, stress markers, stress, inflammation &amp; disease – CVD, Cancer, diabetes, role of food stress management, role of sleep and dietary management in stress.</li></ul>

**References:**

1. Heber, D. *Nutritional oncology*. Elsevier, 2011.
2. Charles N. Serhan, Peter A. Ward, Derek W. Gilroy, Samir S. Ayoub *Fundamentals of Inflammation* 2010 Edition by Charles N. Serhan, Peter A. Ward, Derek W. Gilroy, Samir S. Ayoub, Cambridge
3. Challem, Jack, *The Inflammation Syndrome: The Complete Nutritional Program to Prevent And Reverse Heart Disease, Arthritis, Diabetes, Allergies, And Asthma*
4. Calimeris, *Complete Anti-Inflammatory Diet for Beginners: A No-Stress Meal Plan with Easy Recipes to Heal the Immune System* Paperback – 11 April 2017
5. Appleton, Nancy, *Stopping Inflammation: Relieving the Cause Of Degenerative Diseases*, Square One Publishers, 2005

### SEMESTER THREE

No. of hours/week	Credits
4	4

#### DSE 03C- Nutrition for gut & brain health

##### Course Objectives:

- To understand the importance of nutrition and cognitive function
- To learn, understand and assimilate the effects of gut health on general well being

**Course outcomes:** At the end of the course students would know

- The importance of nutrition in gut and brainhealth.
- They would also understand the influence of diet and other dietary components on the promotion of health and wellbeing.

Unit	Unit content
UNIT I	<ul style="list-style-type: none"> <li>• Introduction to Human Gut Microbiome, Distribution of Microbial Communities in the Human Gastrointestinal Tract.</li> <li>• Functional aspects of the normal gut microbiota – Nutrient metabolism, drug metabolism, antimicrobial effect, immunomodulation and integrity of gut barrier.</li> <li>• Change in gut microbiota in different stages of life</li> </ul>
UNIT II	<p>Influence of diet and dietary components on the gut micro biome:</p> <ul style="list-style-type: none"> <li>• Influence of breast milk and weaning food on the gut microbiota</li> <li>• Probiotic - dietary sources of probiotics, mechanisms of Action–stimulation and suppression of immunity and development of intestinal epithelium.</li> <li>• Prebiotic - dietary sources of prebiotics, mechanisms of Action –modification of gut microbiota.</li> <li>• Effect of macronutrients on gut microbiota</li> <li>• Effect of antibiotics and other drugs on gut microbiome</li> </ul>
UNIT III	<ul style="list-style-type: none"> <li>• Nutrition for brain health, interrelationship between brain, food and health,</li> <li>• Effects of nutrients on brain function – Glucose as fuel for brain, glycemic control and cognition – long term and short-term effect.</li> <li>• Role of Omega-3 Fatty Acids, vitamins on brain function – direct and indirect action,</li> <li>• Minerals (iron, iodine, zinc, copper and selenium) on function</li> </ul>
UNIT IV	<ul style="list-style-type: none"> <li>• Effect of Herbal medicines on cognitive function-St. John's wort (<i>Hypericum perforatum</i>), Ginkgo (<i>Ginkgo biloba</i>), Kava (<i>Piper methysticum</i>) and other herbal medicines.</li> <li>• Flavonoids and Cognitive Function</li> <li>• Food and supplements on brain function – food derived neuroactive cyclic dipeptides, caffeine and tyrosine</li> <li>• Common tools for measuring mood in nutrition science – measuring multiple aspects of mood, measuring depression and anxiety</li> </ul>

**References:**

1. Ishiguro E, Haskey N & Campbell, K. (2018). "Gut Microbiota – Interactive effects on Nutrition and Health,". Academic press, London.
2. Haller, D. (2018). "The Gut Microbiome in Health and Disease". Springer publication, Germany.
3. Best,T & Dye, L. (2015). "Nutrition for Brain Health and Cognitive Performance", Taylor and Francis group, Boca Raton.
4. Liberman RH, Kanarak RB & Prasad C. (2005). "Nutritional Neuroscience", Taylor and Francis group, Boca Raton.



### SEMESTER THREE

#### **SEC 03: Maternal & Child Nutrition**

No. of hours/week	Credits
4	4

#### **Course Objectives-**

- To understand the importance of adequate nutrition for maternal and child health.
- To know the growth and developmental changes during pregnancy, infancy till adolescence.

**Course Outcomes :** At the end of the course students will be able to,

- Understand the basics of maternal & child nutrition and factors effecting nutrition and health outcomes.
- To plan normal diet and manage the nutritional support for better maternal & child health outcomes.

Unit	Unit content
<b>UNIT I</b>	<b>Introduction to maternal and child nutrition</b> <ul style="list-style-type: none"><li>• Current scenario &amp; vital statistics of maternal and child nutrition in India, Major nutritional &amp; health problems of mother and child in India.</li><li>• Maternal and child health Programs in India – ANP, Supplementary Feeding Programs, Special Nutrition Programs, Balwadi Nutrition Programs, Mid-day Meal Programs, Prophylactic doses (vitamin A and iron), ICDS, World Breast Feeding Week.</li></ul>
<b>UNIT II</b>	<b>Importance of nutrition during Pregnancy &amp; Lactation</b> <ul style="list-style-type: none"><li>• <b>Nutrition support during Pregnancy:</b> Introduction to first 1000 days of life, Management and importance of ante natal care, Importance of pre-natal and post-natal nutrition, Nutritional complications during pregnancy.</li><li>• <b>Nutritional management during lactation:</b> Composition of human milk, Effect of nutritional status of mother on quantity and quality of breast milk, Factors affecting breast feeding,</li><li>• Breast feeding in AIDS and Drug abuse.</li><li>• Maternal and child malnutrition: etiology and management, Congenital malformation, Fetal alcoholic syndrome.</li></ul>
<b>UNIT III</b>	<b>Nutrition during Infancy</b> <ul style="list-style-type: none"><li>• Nutritional requirements of infants, Food requirements and modification of foods for infants.</li><li>• Preterm LBW infants, implications for feeding and management, Weaning and principles in preparing complementary food supplements.</li><li>• Guidelines for infant feeding and complimentary feeding, Nutritional management in Diarrhea and Lactose Intolerance.</li></ul>

<b>UNIT IV</b>	<b>Nutrition for Childhood and Adolescence</b> <ul style="list-style-type: none"> <li>• Nutritional requirement of Preschool and school going children, Nutritional challenges and nutrition for child with special need, Childhood Obesity</li> <li>• Nutritional requirement during adolescence, Adolescence pregnancy, weight control, anorexia nervosa, Influence of lifestyle on eating pattern during adolescence,</li> </ul>
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**References:**

1. Park, K, (2000): Park's Textbook of preventive and social medicine 18th edition.
2. Modern Nutrition In health & Disease –Eds Ross C A, Cabellaro B, Robert J. 11th edition, Williams &Wilkins Publication
3. Food Nutrition And Diet Therapy –Kathelene Mahan & Krause, SlviaEscott Stump.
4. Bamji MS, Rao NP & Reddy V.1999.Text book of Human Nutrition. Oxford & IBH

### SEMESTER THREE

No. of hours/week	Credits
4	2

#### **Practical 05- Clinical Nutrition**

**Course Objectives:** To analyse the biochemical parameters in serum and urine samples: To compare the analysed with the reference values and diagnose the condition. To standardize the raw and cooking the weight of basic food ingredients used in cooking process.

**Course Outcomes:** By the end of the semester the student will be able to analyse

- The biochemical parameters and diagnose the physiological condition.
- Food exchange list is made by comparing the raw and cooked weight measures.

Sl No	Practical
1	Determination of biochemical parameters in blood and serum: Preparation of serum
2	Haemoglobin - Cyanmethemoglobin method
3	Glucose
4	Iron - Wong's method
5	Total cholesterol
6	Triglycerides
7	Serum A/G ratio and total protein
8	Serum Vitamin C
9	Serum alkaline phosphatase
10	Serum creatinine
11	Serum urea
12	Enzymes: ALP, SGOT and SGPT
13	Analysis of Urine for: i. Creatinine ii. Urea iii. Albumin

### SEMESTER THREE

No. of hours/week	Credits
4	2

#### **Practical-06 Hospital Internship & Community Nutrition**

##### **Course Objectives:**

- Understands the concept of Defining, assessing, and understanding the health status of population
- Understands the concept of health & Nutrition care at different levels in a community.
- Describes the major causes and etiology of communicable and non-communicable diseases
- The students will be able to identify and monitor malnutrition and hunger in individuals and communities, using clinical, dietary, anthropometric and biochemical measures.

##### **Course Out comes:** Students could be able to

- Determine factors contributing to health promotion and disease prevention.
- Student gains knowledge of achieving nutritional health status at community level through understanding nutrition intervention programs.
- Students will be able to assess, and evaluate the scope of nutrition programs towards health and illness

SI No	Practical
1.	Planning of different therapeutic diets - Diet for Diabetes, DASH diet, Neutropenic, Atkin's, FODMAP, FAD diet, Gout diet, Paleo diet, Diet for Lactose and Gluten intolerance.
2.	Functioning and team approach in hospital dietary.
3.	Hospital Internship – Case studies and development of NCP for disease conditions
4.	Visit to Hospitals and Food Service management in Hospital Dietary Departments
5.	Preparation of Community education aids – Normal and therapeutic conditions
6.	Planning community based affordable nutrition solution for common macro and micronutrient deficiencies.

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## **Semester Four**

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Accepts of method validation: observation and collection of data, methods of data collection, sampling methods, data processing and analysis strategies and tools, data analysis with static package (Sigma STAT, SPSS for student t-test, ANOVA, etc.), hypothesis testing.

### **DISSERTATION**

<b>Course Type</b>	<b>Marks</b>	<b>Credits</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>Project</b>	<b>300</b>					<b>12</b>

The student shall carryout, a semester long project work under the supervision/mentorship of identified guide (internal or external or both). The project work shall be compiled and submitted in the form of dissertation as per the format. The project work shall be original research work related to the programme or case studies that provide an analysis of specific research questions/socio-economic issues, etc. leading to a dissertation as partial fulfilment of the degree.





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## **Question Paper Pattern**

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**MODEL QUESTION PAPER**

**QP CODE:**

**JSS Academy of Higher Education & Research, Mysuru**  
(Deemed to be University)

**First Semester M.Sc., (Program) (RS-1) Examination - Year**

**Subject:**

*Note: Draw neat, labeled diagrams wherever necessary.*

*Your answers should be specific to the questions asked.*

**Time: 03 Hours**

**Max Marks: 70**

**I. LONG ESSAYS (Answer any TWO of the following)**

**2x15=30 Marks**

- 1.
- 2.
- 3.

**II. SHORT ESSAYS (Answer any FIVE of the following)**

**5x6=30 Marks**

- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

**III. SHORT ANSWERS (Answer all the following)**

**5x2=10 Marks**

- 11.
- 12.
- 13.
- 14.
- 15.

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**MODEL QUESTION PAPER**

**QP CODE:**

**JSS Academy of Higher Education & Research, Mysuru**  
(Deemed to be University)

**First Semester M.Sc., (Program) (RS-1) Examination - Year**

**Subject:**

*Note: Draw neat, labeled diagrams wherever necessary.*

*Your answers should be specific to the questions asked.*

**Time: 02 Hours**

**Max Marks: 50**

**I LONG ESSAYS (Answer any TWO of the following)**

**2x10=20 Marks**

- 1.
- 2.
- 3.

**II SHORT ESSAYS (Answer any FIVE of the following)**

**5x4=20 Marks**

- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

**III SHORT ANSWERS (Answer all the following)**

**5x2=10 Marks**

- 11.
- 12.
- 13.
- 14.
- 15.

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